

bitmap drawing data are supplied in parallel with each other to said respective beam-ON/OFF means in the scanning direction of the charged-particle beam, and the plurality of charged-particle beams are controlled to irradiate a sample surface, thereby drawing a two-dimensional pattern.

REMARKS

Applicant, having received a Notice of Allowance mailed November 18, 2002, in the above-identified application, requests that the Examiner consider and enter the instant Amendment, pursuant to 37 CFR 1.312.

Consideration of this Amendment under 37 CFR 1.312 is deemed appropriate to improve the syntax and form of the subject application. As amended, the specification and claims 1, 6, 8 and 13 will read more clearly in the issued patent, and thus will enable the public to more readily understand Applicant's invention.


Applicant submits that these changes are directed to purely formal matters and do not affect the scope of the claimed invention.

As the Examiner is familiar with the subject application, Applicant believes that consideration of the instant Amendment will result in no substantial amount of additional work on the part of the Patent and Trademark Office. Accordingly, Applicant requests that the Examiner authorize entry of this Amendment.

Favorable consideration and an early passage to issue are requested.

Applicant's undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our address given below.

Respectfully submitted,



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APPENDIX A

IN THE SPECIFICATION

Please substitute the paragraph beginning at page 3, line 5, with the following.

-- In the drawing step, JOB data 61 serving as drawing schedule data of the electron beam apparatus is read in drawing condition setting (step 60). In stripe data read (step 62), drawing pattern data of one stripe to be drawn by one stage scanning is read out from the buffer memory in step 58. The drawing pattern data made up of basic figures undergoes bitmapping processing (step 63). The bitmap data is transferred to a pattern memory in step 64, and output to a beam blanker serving as a beam-ON/OFF means in step 65. Then, an electron beam is ON/OFF-controlled to draw a pattern (step 66). After one stripe is drawn, the drawing step restarts from stripe data read (step 62) for drawing the next [strip] stripe. This is repeated to complete drawing of all chips placed on a wafer. --

Please substitute the paragraph beginning at page 3, line 20, and ending on page 4, line 9, with the following.

-- Fig. 10 is a block diagram showing an electron beam drawing apparatus for drawing a pattern in accordance with data flow (prior art) of the above drawing system. The electron beam drawing apparatus is roughly constituted by an electron beam drawing apparatus main body 280 and a drawing control system 290. The electron beam drawing apparatus main body 280 is comprised of an electron gun 201, convergent lens 202, reduction lens 203, deflector 204,

blanker 205, and stage 207. An electron beam EB emitted by the electron gun 201 is converged into 0.1 μm or less via the convergent lens 202 and reduction lens 203 to irradiate a wafer 208 on the stage. The electron beam EB is adjusted in position by the deflector 204 (made up of two, a main deflector 204-1 and a sub-deflector 204-2), and ON/OFF-controlled by the blanker 205. --

Please substitute the paragraph beginning at page 4, line 23, and ending on page 5, line 2, with the following.

-- After [this] the bitmap data is transferred to a blanker control unit 220, the electron beam EB is ON/OFF-controlled. In synchronism with this, a deflector control unit 222 settles the beam position, and a stage control unit 223 controls the stage position. A series of drawing operations [are] is performed. --

Please substitute the paragraph beginning at page 6, line 20, with the following.

-- Also, in the data transfer step before the start of drawing, a time required to transfer drawing pattern data obtained by data conversion from an external storage device represented by a magnetic disk to a buffer memory unit is prolonged. In the drawing step, a long time is spent on bitmapping drawing pattern data made up of basic figures. --

Please substitute the paragraph beginning at page 7, line 4, with the following.

-- Recently, there is proposed a method of drawing a pattern by ON/OFF-controlling a plurality of electron beams in parallel with each other using multi-beams. A plurality of electron beams are arranged in m rows \times n [column] columns (m and n are integers of 1 or more), and each electron beam draws a pattern in a basic drawing region, thereby drawing a two-dimensional pattern. This high-speed drawing method also suffers the same problem because the periodicity

of design pattern data does not coincide with that of basic drawing regions arranged in m rows \times n columns. This inhibits increasing the speed of the electron beam drawing apparatus. --

Please substitute the paragraph beginning at page 8, line 18, with the following.

-- That is, a charged-particle beam drawing data creation method of supplying bit information created from design pattern data in a scanning direction of a charged-particle beam, ON/OFF-controlling the charged-particle beam to irradiate a sample surface, and exposing a two-dimensional pattern by scanning the charged-particle beam comprises the steps of: --

Please substitute the paragraph beginning at page 10, line 1, with the following.

-- According to still another preferable aspect of the present invention, in the charged-particle beam drawing data creation method, the cell pattern is not less than twice [in] the size of the basic drawing region. --

Please substitute the paragraph beginning at page 10, line 9, with the following.

-- A charged-particle beam exposure apparatus for supplying bit information created from design pattern data in a scanning direction of a charged-particle beam, ON/OFF-controlling the charged-particle beam to irradiate a sample surface, and exposing a two-dimensional pattern by scanning the charged-particle beam comprises: --

Please substitute the paragraph beginning at page 10, line 26, and ending on page 11, line 3, with the following.

-- According to one preferable aspect of the present invention, in the charged-particle beam drawing apparatus, the basic drawing region includes all or some of the regions of a plurality of cell patterns. --

Please substitute the paragraph beginning at page 11, line 18, with the following.

-- According to still another preferable aspect of the present invention, in the charged-particle beam drawing apparatus, the cell pattern is not less than twice [in] the size of the basic drawing region. --

Please substitute the paragraph beginning at page 25, line 16, with the following.

-- In this case, bitmap data of [strips] stripes which can be drawn by one stage scanning is transferred to a pattern memory (A) 118-1. This bitmap data is parallel-transferred to the BAA control unit 121 as signals for ON/OFF-controlling the beam. A pattern is drawn in synchronism with a deflector control unit 122 and a stage control unit 123. While stripe data (A) 118-1 (pattern memory) is drawn, bitmap data of stripe data (B) 118-2 for the next drawing is prepared. Thus, drawing of the stripe data (B) 118-2 can start immediately after the stripe data (A) 118-1 is drawn. --

IN THE CLAIMS

1. (Amended) A charged-particle beam drawing data creation method of supplying bit information created from design pattern data in a scanning direction of a charged-particle beam, ON/OFF-controlling the charged-particle beam to irradiate a sample surface, and exposing a two-dimensional pattern by scanning the charged-particle beam, the method comprising the steps of:

extracting a cell pattern as one unit of a periodic structure from design pattern data having a periodic structure, and registering the cell pattern;

creating arrangement data to be rearranged in a basic drawing region defined by a charged-particle beam exposure apparatus using the cell pattern, and registering the arrangement data; and

cutting out data from the cell pattern in accordance with information of the arrangement data, and creating data of the basic drawing region.

6. (Amended) The method according to claim 1, wherein the cell pattern is not less than twice [in] the size of the basic drawing region.

8. (Amended) A charged-particle beam exposure apparatus for supplying bit information created from design pattern data in a scanning direction of a charged-particle beam, ON/OFF-controlling the charged-particle beam to irradiate a sample surface, and exposing a two-dimensional pattern by scanning the charged-particle beam, the apparatus comprising:

means for extracting a cell pattern as one unit of a periodic structure from design pattern data having a periodic structure, and registering the cell pattern;

means for creating arrangement data to be rearranged in a basic drawing region defined by the charged-particle beam exposure apparatus using the cell pattern, and registering the arrangement data; and

means for cutting out data from the cell pattern in accordance with information of the arrangement data, and creating data of the basic drawing region.

13. (Amended) The apparatus according to claim 8, wherein the cell pattern is not less than twice [in] the size of the basic drawing region.

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